Determination of frutooligosaccharides adsorption parameters using ion-exchange resins

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Fructooligosaccharides (FOS) are non-digestible sugars that beneficially affect the host by stimulating the growth of specific bacteria in the colon. In large scale, FOS can be produced from sucrose by fermentation. The fermentative broth obtained from this process is a complex mixture of salts and sugars. These sugar mixtures include FOS, namely kestose (GF2), nystose (GF3) and fructo-furanosylnystose (GF4), but also fructose, glucose and sucrose that must be separated.

The major challenge when designing the downstream separation process is the choice of an efficient ion-exchange resin. Therefore, adsorption isotherms of the different compounds on a mixture are an important parameter to consider when selecting the resin. Moreover, salts and other sugars present in the mixture will influence the adsorption. In view of this, in the present work adsorption isotherms of FOS, both from fermentative broths and pure mixtures, were determined for several poly(styrene-co-divinylbenzene) commercial resins in the sodium and calcium forms.

A static adsorption-desorption method was used to determine the equilibrium adsorptions.

The adsorption isotherms for FOS were appropriately fitted using linear regression models. Since FOS separation is mainly based on size exclusion, GF2 was found to be the most adsorbed sugar in all resins, followed by GF3

and finally GF4. Results demonstrated that there are no significant differences between the adsorption of a pure mixture of FOS and a fermentative broth using the studied commercial calcium resins. However, this was not observed for the sodium form resin. In this later case, the sugars from the fermentative broths were found to be more adsorved than from the pure mixtures.

Results gathered in this study clearly demonstrated the importance of determining the adsorption parameters using real fermentative broths instead of pure mixtures, as the presence of other sugars and salts can influence in the adsorption.